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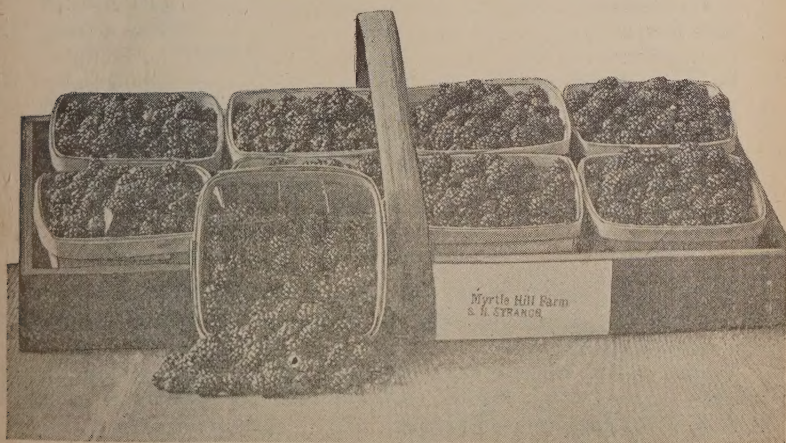
Agricultural Experiment Station

OF THE

College of Agriculture and Mechanic Arts,

RALEIGH.

GRAPES AND SMALL FRUITS.



DEWBERRIES.

N. C. COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

THE NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

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Visitors will be welcome at all times and will be given every opportunity to inspect the work of the Station. Bulletins and reports are mailed free to all residents of the State upon application.

Address all communications to

THE AGRICULTURAL EXPERIMENT STATION,

RALEIGH, N. C.

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THE CULTURE OF GRAPES AND SMALL FRUITS.

BY W. F. MASSEY, HORTICULTURIST.

Introduction.

Before the days of the Experiment Stations and the study of means for combatting fungus diseases on cultivated plants, the Southern Horticulturists had almost despaired of growing the varieties of grapes cultivated in the North, because of the prevalence of mildew and rot in our climate.

If the Experiment Stations had done nothing else than to bring before the cultivators the use of the Bordeaux mixture and other remedies for fungus troubles they would have warranted all they have cost. Armed with the remedies or preventives of disease and the means for combatting insect attacks the culture of the Grape has attained great importance in the South, and we are no longer obliged to say as the late W. N. White said in the first edition of his "Gardening for the South," that it is useless to attempt to grow the *Labrusca* and *Aestivalis* species of grapes in the South, for we can grow them to as great perfection as they are grown in any section of the country, and can make as fine wine as is made anywhere, while we can put the ripe fruit into the Northern markets when they are bare of grapes from elsewhere.

Then, too, it is important that the grower for home use in the South should be acquainted with the best methods of culture and the same preventives of disease and insect attacks. It is for this class of growers that this bulletin is mainly intended, for the large growers are already well informed on the subject. Farmers as a class do not have fruits enough for their home use, while it is perfectly easy to have a full supply of healthful fruit, and if this bulletin will lead the farmers of the State to better supply themselves with grapes and small fruits, its mission will have been accomplished.

The Culture of Grapes.

PROPAGATION OF THE GRAPE.

Grapes are commonly propagated from long cuttings set in the open ground in the fall. They are also grown from single-eye cuttings under glass and by layers, and inferior sorts can be changed at once into good ones by grafting the improved variety on the base of the inferior stem.

Most of our grapes which are here classed as "bunch" grapes belong to the botanical classes of *Labrusca* and *Aestivalis*, while others are the result of crossing these with the European *Vinifera* and other genera. Most of these are easily grown from long cuttings set in rows in the fall. Some, like the Delaware and Norton's Virginia do not root readily if set at once, but if tied in bunches and buried upside down in the earth during the winter and set in the rows in proper position in spring they will root readily. We will not attempt to explain why this is so, for we do not know, but we do know the fact. In making cuttings for setting in the open ground our practice is to make them of the mature young wood of the past season's growth. We use three eyes or buds and cut off immediately below the lower bud and about half an inch above the top one. Where the wood is very short jointed it may be necessary to use more buds for we want the cuttings about ten inches long. The cuttings are set so that the top bud is just about the surface of the ground. If the soil where the cuttings are set is hard clay it will help the rooting if the trench is filled half full of sand in which to insert the base of the cuttings.

Propagation from single eyes is made only under glass in green-houses where there can be had bottom heat in the bed from hot water pipes below. The cuttings are made in the fall and buried in sand till February in order to get calloused. They are then set horizontally an inch beneath the surface of the sand in the propagating bench, and when well rooted are potted into small pots, from which they are turned out later into the open ground. These make the very finest of plants, but can not be produced as cheaply as those rooted in the open ground.

Having strong growing vines of inferior grapes they can be easily grafted with better sorts. The vine to be grafted on must be cut down to about the crown of the root. A cion is used with three eyes, one being near the base. The stock is split straight across, and the short part of the cutting below the last bud is cut wedge shape and inserted as in the ordinary method of cleft grafting, care being taken as usual to have the young growing tissues between the bark and

wood cion and stock in close contact. If the stock is very large leave a small wooden wedge in the split to prevent the pressure crushing the graft. No wax is needed, but the soil must be heaped back over the graft. The advantage in this is that the root being strong and well established a bearing cane can be produced the first season.

Strong plants can be produced from old-established vines by layering. Take a young mature cane of the last season's growth near the ground. About two feet from the end cut a sloping incision half way through the cane. Bend the cane into the soil at the cut and pin it fast, and then turn the end up in an upright position and tie to a stake. By fall the layer will be well rooted and can be separated from the parent vine. The Scuppernong will root in this way without even making the incision, but it is better to make the cut as roots emerge more readily from the cut surface. Another method of increasing the Scuppernong and other of the *Vulpina* class of grapes is to make cuttings of the one-year wood about a foot long. Cut the lower end wedge shape and then take a piece of root of the same class of grape, the wild Bullace is as good as any, about three or four inches long. Split it in the middle and through this split insert the wedge-shaped end of the cutting, and then set it as an ordinary cutting. This will produce a much stronger vine in one year than a cutting without the piece of root, since new rootlets will be produced from the piece of root and the cutting too and both will unite permanently.

PLANTING THE GRAPE VINE.

Grape vines grown from long cuttings will usually make two tiers of roots, and it is important in the South that both should be planted deep enough to grow. Some growers of experience prefer the long cutting plants, believing that the roots should be deep in the ground. In my own experience I have been led to prefer the plants grown from single eyes with long spreading surface roots. These are certainly best for a heavy soil, while the long cuttings may be better in gravelly or deep sandy soils where grapes are commonly grown in the South. Either can be made a perfect success by proper planting and culture. In setting the long cuttings we trim off the top tier of roots closely and shorten the lower ones to about six inches long. The end fibres will in any event be largely dried, and the new rootlets will put out more freely from the pruned roots. In fact we have come to the conclusion that pruning the roots of any tree at transplanting is as important as the pruning of the top. We are not ready yet to adopt entirely what is called the Stringfellow mode of trimming the roots to a mere stump, but we do know that finer trees and vines are made by fairly close pruning of the roots. Of the Stringfellow method we will have more to say further on. Thorough preparation

of the soil is as important in planting a vineyard as in planting an orchard of trees. Never plant on a heavy undrained clay soil if it can be avoided. A rocky hillside sloping to the east with a gravelly soil is an ideal place for the grape, and fine crops have been grown on deep sandy soils by proper fertilization. In fact no better grapes are grown than those produced on the pine barrens of North Carolina near Southern Pines. We grew there Niagara grapes with bunches of such size that they had to be packed in peach baskets, and the Delawares grown there are models of beauty. Good drainage and a warm soil and exposure are essential to success in vineyard culture. The distances for planting and the modes of training are innumerable. Where the old-fashioned training to stakes and spur pruning is practiced the vines can be set six feet apart each way. But this method is rapidly becoming obsolete in this country. In Europe and to some extent in California the vines are grown without support and are pruned back to mere stumps annually. But in the eastern section of the country some form of trellis training is essential. We do not propose in this bulletin to confuse the reader with a discussion of the innumerable methods of pruning and training, but simply to give the methods that have been found best in this State, and refer those who wish to study various methods to the numerous books on the subject.

PRUNING AND TRAINING THE GRAPE.

We have tested many methods of pruning and training and have finally settled upon what is known as a modification of the Munson trellis or what is now called the "Shelter trellis," as the best for our climate for the varieties of the bunch grapes. For the Scuppernong and other varieties of the Vulpina class there is nothing better than an overhead arbor made with good stout posts with wires stretched overhead high enough to work teams under.

Hence we will not attempt in this bulletin to discuss all the various methods of pruning and training, but simply to give what we have found best for the climate of North Carolina. The first season after planting after cutting back the vines to about three eyes from the ground at planting, we select the strongest shoot and then encourage the growth of this in every way possible, the object being to get a single strong cane. Side shoots will appear along this cane, and these we allow to make a single leaf and then pinch the growing point, keeping up this practice through the season, simply letting one new leaf form on the side shoot before pinching. We do this rather than pinch off entirely, to prevent the bud forming at the base of the shoot from starting for we want all these buds in perfect condition at the next pruning. During this first season a simple stake is all that is needed to tie the cane to. The following spring the trellis

should be built. I should have said that for the mode of pruning advised we plant the vines in rows ten feet apart and eight feet apart in the row. The trellises will then be ten feet apart, giving room to haul between each row. To construct the trellis we set stout posts of lasting material half way between each alternate vine or sixteen feet apart. These posts should stand six feet above ground. On top the posts pieces of 2 by 4 scantling two and a half feet long are firmly spiked to the posts by their middles. Galvanized wires are then stretched, one line along the line of the posts and two lines horizontal with the middle one along the ends of the cross pieces. The end posts must of course be well braced so that the wires can be stretched tight. If the canes have made the proper growth during the previous season they can now be cut at the height of the middle wire and tied to it. Any which are not yet strong enough for this must be shortened back to encourage a stronger growth, and trained up to the wire by stakes. Two canes are allowed to grow this season from the upper end of the cane and those below rubbed off. The growth of these canes is promoted by the same method of pinching during the summer as was practiced the first season. At the pruning for the third season these canes are shortened to four feet each and no summer pinching is practiced, except one pinching of the fruit shoots six or more eyes beyond the last bunch of fruit. The canes or arms are trained along the central wire and the fruiting branches hang over the side wires. The mass of foliage now completely protects the fruit beneath from the dashing summer rains, and it will be found that on a trellis of this sort the fruit will be almost as exempt from the rot without spraying as it will on a vertical trellis with abundant spraying. But this does not mean that the shelter trellis will do away with spraying entirely, but it makes the spraying more effective. In the subsequent pruning strong canes that grow near the centre of the vine are trained out as arms and the old ones are cut away. The vines are thus continually renewed and kept in the same shape as formed at first, and far better fruit is grown on these long canes than on the short spurs of the old spur system of pruning.

Of course the fertility of the soil must be maintained. If stable manure is available it may be used if reinforced with a due proportion of acid phosphate and muriate of potash, but we prefer in the vineyard to use a complete fertilizer of chemicals, since the excessive use of stable manure makes too rank growth and inferior fruiting. Since grape roots ramble long distances in search of food (I have traced the roots of old vines over 50 feet) the application should be to the whole surface after the first season, and a mixture containing about 3 per cent of nitrogen, 8 per cent of phosphoric acid and 4 per cent of potash will in most soils be a suitable one to use at the

rate of 500 pounds per acre annually. This is for such soils as are most favorable to the grape and which are generally deficient in potash. On red clay upland soil a smaller percentage of potash will be needed.

In the training of Scuppernongs and their allies the James and other black grapes of the Vulpina class we have said that the old southern method of horizontal arbors is the best. But the old notion that these vines do not need pruning is an error. They repay proper pruning as well as any, and if left unpruned they soon become a mass of tangled wood that makes the gathering of the crop difficult. The pruning will consist mainly of taking out the old and stunted canes and training out in good shape the strong and vigorous ones. No close pruning, as with the Labrusca or bunch grapes, can be practiced, for these rampant vines need plenty of room and wood for their best results. In planting Scuppernongs for vineyard they should be set about 40 feet apart each way if in strong land. For a year or more they can be trained to stakes till high enough to build the arbor. The old method is to make the arbor of cypress posts and place rails across for the vines, but it is better and neater to put cypress rails along the tops of the posts and stretch wires the opposite way two feet apart. After the vines have grown to meet on the trellis they will need no further cultivation but will be benefitted by a good mulch of rotted leaves and mold from the woods, and a dressing of the fertilizer mixture heretofore advised.

The Scuppernong does not set its fruit freely from its own blossoms, and where there are no wild bullace grapes in the neighborhood of a barren or staminate character it is always better to plant a male or staminate vine near by the arbor so that the crop will be fuller. In most places here where the Scuppernong is grown there are generally plenty of barren or pollen bearing wild vines near by, and the naturally sterile character of the Scuppernong is not noticed. But if there is a barren vine on the same trellis or arbor the crop will be much heavier on the fruiting vines. There are some cross-bred varieties of the Scuppernong and bunch grape which are highly praised, and which we hope soon to test for the benefit of our growers.

VARIETIES.

The suggestion of varieties of any fruits can only be made as suggestions, for they vary in their adaptability to the various soils and climates in the State, and a variety that is popular and profitable in one section may fail entirely under different soil and climatic conditions. Hence we will endeavor to suggest those that have been more generally successful.

The so-called Bunch grapes, as they are called here to distinguish them from the Scuppernong class, are generally members of the La-

brusca and Aestivalis species, though of late years many fine varieties have been produced by Mr. Munson of Texas by crossing these with the Linccumei species, native to Texas. Many, also, of the Labrusca varieties are really cross bred varieties of Labrusca and Vinifera, the European grape.

Concord—The most general favorite for family planting. Succeeds everywhere, and grows strongly. Very liable to the black rot, and like most grapes needs careful attention to spraying to prevent this.

Champion—About the earliest and poorest grape grown, worthless except as a stock for grafting weaker-growing varieties on. The Delaware does finely when grafted on the Champion root.

Columbian—This is a strong grower and makes probably the largest grapes of any. It ripens early and is showy, but is of poor quality.

Campbell's Early—One of the newer and more promising grapes. It is early and of fine quality, and is probably the best very early grape.

Eaton—A seedling from Concord, but larger and more showy, and promises to be one of the best.

Ives—This is an old variety chiefly planted for wine-making. It colors early but is really late in ripening. A strong grower and a prolific bearer, and is a good grape when well ripened, but it colors so early that it is often gathered unripe and hence has a bad reputation for quality.

Moore's Early—A very early grape of the Concord class. Not so large in cluster as Concord but of good quality and well suited to the South.

McPike—We have not fruited this grape but it is very highly spoken of in the west, and is said to be of great size and good quality and a strong grower. It is regarded as one of the most promising grapes. It is a seedling from the Worden.

Worden—A fine large grape, similar to Concord but larger and of better quality. A strong grower and prolific.

Agawan—Formerly known as Rogers No. 15. A red grape of fine size and good quality. It grows strongly and is rather early in ripening.

Brighton—An early and high quality grape, but very liable to rot and mildew and needs careful attention and high culture. One of the very best when well grown.

Delaware—Probably the very best of the red grapes, and one peculiarly suited to the soils and climate of the South. The bunches are small and so are the berries, but the quality makes up for these, and the vine is very prolific. It was over propagated when first

brought out, and hence grew weakly, but has now recovered and is a fairly strong grower.

Brilliant—One of Mr. Munson's seedlings. The berries are larger than Delaware and of the same color. Skin very thin and flesh of high quality. It is too tender in the berry for shipping, but is one of the best for home use. It is a strong and healthy grower and very prolific.

Salem—Another of the Rogers grapes and probably more grown than any of them. Berries large, red and of good quality. Vine a good grower.

Diamond—This is the leading early white grape. Ripens before Moore's Early. A very strong grower and good bearer, and the fruit is of fine quality.

Empire State—A very strong growing vine, bunches large and berries of good size, and of good quality. Drops too easily from the bunch to make a shipping grape.

Perkins—A light reddish grape that has proved very well adapted to the central part of this State. Its freedom from rot and its luxuriant growth and productiveness make it desirable though the fruit is only of fair quality.

Lutie—A fine large red grape, and the freest from rot and mildew of any grape we know. It has a strong foxy aroma which some do not like, but the berries are to our taste as good as Concord and earlier.

Green Mountain—This was also sent out under the name of Winchell. We have the two growing side by side and they are identical. It is a very early grape, of the so-called white class, of a golden color when ripe and of very good quality. Will not ship well but is fine for home use.

Niagara—Probably the most popular and generally grown of all the white grapes. It succeeds finely in the South and is one of the best shipping grapes, as it ripens with the Delaware. These two varieties are almost the only ones grown in North Carolina for shipment North. The vine is a strong grower, and the fruit of fairly good quality, or about equal to Concord.

Mr. Munson, of Denison, Texas, has produced a great number of seedling grapes that are specially adapted to Southern conditions, and all of which we hope to test. Some of them we will fruit shortly.

SCUPPERNONG CLASS.

Scuppernong—This is the popular Southern grape for late use and wine-making. It is of a russet color with a very thick skin and sweet juice. A rampant grower and usually grown on horizontal arbors one vine covering a great area.

Thomas—A large, black grape of the scuppernong class, and one of the best for wine.

James—This is the largest of the class. Skin thinner than the Scuppernong and black in color. Keeps well after cutting.

Flowers—A black grape of medium size and probably the latest grape grown. Quality very good.

La Salle—This is one of Mr. Munson's hybrids. Berry large and black. Quality equal to Scuppernong or better. Ripens earlier than any of the class.

San Jacinto—Another Munson seedling. Said to make a much larger cluster than Scuppernong and of better quality. Ripens two or three weeks after the Scuppernong and is very prolific.

We take these two last descriptions from Mr. Munson's catalogue, and hope soon to fruit the vines.

Efforts are being made by the U. S. Department of Agriculture in this State to test the practicability of growing the *Vinifera* grapes, such as are now grown in California, by grafting them on our native roots that resist the *Phylloxera* insect. It is hoped that these experiments will succeed.

The Culture of Small Fruits.

STRAWBERRIES.

The culture of the Strawberry has become the most important interest in some sections of the State. The climate and soils of the coastal plain suit this fruit admirably, and its cultivation has become very extensive and profitable. The shipper to the northern markets wants the best early and productive sort that will carry well. Hence for his purposes earliness, productiveness and firmness of fruit are the leading considerations. On the other hand, the grower for home use wants not only earliness, but quality and productiveness, and if he gets the quality it is immaterial to him whether the fruit would ship well or not. Then, too, he wants mid-season and late varieties to prolong the season. Therefore, in the consideration of varieties we will make the distinction between those best for home use and those for market.

PROPAGATION.

The Strawberry naturally propagates itself by making runners which root along the rows. The best plants are always to be had from new plantations during their first summer and before they have become exhausted by fruiting. The transplanting can be done at any time when good, well rooted young plants are to be had. If plants are set in late summer and a good stand is had they will pro-

duce a fair crop of fruit the following spring, but the most certain time in the warmer sections of the State for setting the plants is in November and December. The summer heat and drought is then over and the soil is moist and the plants live easily.

PREPARATION AND PLANTING.

There is no better preparation for a Strawberry plantation than the growing of a crop of cow peas on the land the previous season. Where the object is to get a field in the best condition for Strawberry planting, it is a good practice to plow under the whole growth of the peas deeply as soon as frost has killed them, if the planting is to be done in the spring, which is the best time for planting in the elevated western section of the State. But if the planting is to be done in the late fall, it will be hard to get the land in the proper order if the whole growth is turned under. Hence it will be better to mow the peas for hay in September and then plow and prepare the stubble only. The plowing and preparation of the land should be of the most thorough character. On the black sandy soils of the eastern part of the State, where the great Strawberry fields are located, we would only advise a good plowing, but on the red clay soils of the upland districts it will be a great advantage to follow in the furrow of the breaking plow with a subsoil plow and loosen the subsoil to a depth of at least fifteen inches. The plants will then fare much better in a drought than if the soil is shallowly plowed, for the Strawberry is a deep-rooting plant when it has the chance to run down, and it is very fond of moisture, always doing better on lands where the soil water is not far from the surface. Heavy manuring with commercial fertilizers is better for the Strawberry than the use of stable manure, which is apt to give trouble by bringing in weeds and grass and white clover. With proper moisture conditions in the soil the next most important thing is fertility. On old garden soils that have been enriched for generations there may be little need for heavy manuring, but on most of the lands devoted to commercial Strawberry growing the fertilization of the soil is the most important matter. The plants are gross feeders, and the difference between a heavy crop of fine fruit and a dead failure generally depends on the liberality with which the fertilizers are applied. In preparing to plant run furrows four feet apart, and in these scatter a liberal supply of a high-grade complete fertilizer. The following will be a good mixture for planting time: Acid phosphate, 900 pounds; cotton-seed meal, 900 pounds; muriate of potash, 200 pounds—to make a ton. Of this use 500 pounds in the furrows at planting time and 500 pounds more with the first working in the spring, applying it on all the space between the rows. After a crop of fruit has been taken off the soil should be thoroughly worked and another 500 pounds of the fertilizer worked in per acre.

We set the plants about fifteen inches apart in the four-foot rows and then train in the runners alongside the rows so that the next season there will be a thick matted row. Never keep a strawberry plantation longer than to make two crops. Plant a patch every fall or spring, according to location, and plow down the old plants after they have made the second season's crop. In this way you will always have one patch bearing its first fruit and one in full crop to be plowed down after the fruit is off and to be followed by a new planting that fall.

CARE OF THE PLANTATION.

In all parts of the State east of the Blue Ridge there is no need for a mulch on the Strawberries as a winter protection, but in the colder region west of the mountains a light mulch of straw over the whole bed will be a protection of value. A light cultivation should be given the first thing in the spring as signs of growth begin, and at that time a mulch of pine straw should be placed between the rows for the double purpose of keeping the fruit clean and for pulling over the rows when frost threatens and the plants are in bloom. At this first working it will be a decided advantage to give the bed a dressing of nitrate of soda at rate of 100 pounds per acre, scattering it ahead of the cultivation and when the plants are dry. If applied when they are wet with dew or rain any that touches the leaves may scorch them. The great need of the Strawberry is water. Not water standing in the soil, of course, but a soil not too greatly elevated above the water table in the soil. Soil of moderate fertility, if of a moist character, will make more berries than rich soil in a more elevated and dry situation. A moist, dark sandy soil, such as is plentiful in the eastern part of the State, is an ideal soil for the Strawberry, and such a soil will stand heavier use of commercial fertilizers than a dryer soil, because the fertilizer will be better dissolved. We have seen very minute directions given in print in regard to the setting of Strawberry plants by spreading the roots out horizontally and placing the soil compactly over them. We prefer to set the plants with an ordinary garden trowel, opening up a hole, placing the roots in behind the trowel and then letting the earth fall back with the roots straight down. Care is needed not to plant too deep so that the crown bud will be covered and on the other hand not too shallow so as to leave the top of the roots exposed.

GROWING POT PLANTS.

Go through the patch when the first runners begin to make roots and take them when they have made little white roots about an inch long. Have ready some three-inch flower pots and pot the plants in these, using a rich and well-mixed compost of old rotted manure

and rotted sods that has been piled and turned for months till fine and mellow. Then place the plants close together in an ordinary cold frame on a bed of coal ashes to keep the worms out of the pots. Place over them a screen made of laths tacked an inch apart, and attend regularly to watering them. They will soon have the pots well filled with roots and can then be knocked out and planted at any time with perfect success and a full crop can be had from the plants the following season. Many books tell about growing potted Strawberry plants, and as a rule tell the inexperienced grower to fill the little pots with compost and bury them along the rows and place the runners on them to root. Any one who has ever tried this laborious plan will be apt to abandon it soon. It is a great deal easier and better to take the partly-rooted runners and pot them at a bench in the shade, where you can pot a thousand while you would be crawling over the patch to plant a hundred, and the plants all being put where they can be regularly watered, will grow much faster and better. The nurserymen, who grow potted plants by the thousands, would be very foolish to crawl over the ground to bury pots, and they could not possibly sell them at a reasonable price if they did this. They often try to make their customers think they do, but they don't.

COLD FRAMES.

These pot-grown plants are the only kind that should be used in planting frames for forwarding the fruit. They can be set in the frames about ten inches apart each way in September or October. The soil in the frames should be made as rich as for the growing of a crop of winter lettuce. Any runners that may show on the plants in the fall should be regularly nipped off, and all weeds kept down. The frames should be left fully exposed during the winter till about the first week in February, when the glass sashes should be put on. Careful attention should be given to airing the frames in sunny weather, and closing them up at night. When a warm rain comes strip the sashes down and let the bed have the water, and if the soil gets dry and no rain comes they should be well soaked with water. If the frames are carefully attended to the fruit should be ripe from two to three weeks ahead of that in the open ground, and when grown in quantity the artificial culture should be made a very profitable matter. The time is close at hand when our market growers will have to adopt some of the intensive methods used by the northern gardeners if they are to meet successfully the competition from Florida and the other States South of us. When one becomes skillful in the use of simple glass sashes he will soon be wanting to go into regular winter forcing with heated green-house. Our gardeners have hardly realized what profit there is in intensive

culture under glass. The northern gardeners have successfully met the southern competition by covering acres of land with heated green-houses and producing therein products of such great excellence as to command far better prices than the southern products without such aid. One grower near Boston has found that it there even pays him to use arc electric lights over his green-houses in the production of lettuce. Here, our abounding sunshine, even in the coldest weather, gives us a great advantage over the northern growers, and we have no need for such expensive lighting as they find needed in their dark and cloudy winter, where, as one gardener recently told me, he has seen six weeks pass without one whole sunny day. Some day our growers will realize the immense advantage their sunny climate gives them for the use of glass and they will then wonder why they so long used the makeshift of cloth on their frames.

FORCING IN WINTER.

As some of our readers who have green-houses may wish to experiment with Winter Strawberries, I will briefly detail the method to be used. Some imagine that they can take up plants from the garden and put them in pots and force them at once. But this can not be done. It takes careful preparation to get plants in shape for forcing. The plants are started just as we have described, in three-inch pots. As soon as these pots are filled with roots they are repotted into four-inch pots and when these are filled with roots into six-inch pots, in which they are to be forced. The pots are placed handy to water, on a bed of coal ashes to keep the worms out of them, and they are encouraged to grow and make strong crowns, which are essential to fruiting well. All runners must be rigorously kept off, and the pots kept clean of weeds. As the weather grows cold the pots are plunged to the rim in coal ashes and left exposed to the weather and allowed to get a little dryer, but not too dry. They must be allowed to go to rest, for they can not be well forced till they have had some winter rest. About first of January they can be taken into the house and the old leaves cleaned off, and the surface of the soil in the pots carefully stirred. For a while the temperature of the house should not exceed 45 degrees at night. As new growth starts the temperature should be gradually raised till finally they are in a night temperature of 60 degrees. Careful attention must be given to airing the house in day time to prevent too high a heat. Watering must be regular, and once a week they should have a dose of liquid manure made by dissolving cow manure in water to the color of tea. The first essential in forcing is to have the pots well matted with roots, for if you apply liquid manure to plants that have not gotten full possession of the soil you will sour

the soil and ruin the plants. Never water till there is need for it and then soak all through, and always apply the liquid manure after a good watering and not when the plants are dry. The pots must be set far enough apart to allow the fruit to hang clear of other pots. A variety with perfect flowers should be used for forcing, and it is of advantage to go over the plants every day at noon and apply the pollen to the pistils of the flowers with a camel-hair brush. The novice will usually make at least a partial failure in forcing till he gains experience in handling plants under glass, but when well done the forcing of Strawberries can be made profitable. They are marketed in small fancy paper boxes and bring, of course, many times the price of the outdoor crop, for when well grown by a skilled hand the fruit is of remarkable size and beauty. When our gardeners acquire skill in the use of green-houses there are many things besides Strawberries that can be forced and at a great profit, too.

VARIETIES.

These are now so numerous, and new ones are coming out annually with great claims for excellence from their growers. The southern grower is mainly concerned in getting the earliest and most productive berry of good size that will ship well. These qualities are hard to combine, and the catalogues will give the planter little help, for every variety listed is commonly praised all that the grower can, and the inexperienced buyer is often puzzled to know which are really the best, when all are claimed to be best.

Lady Thompson.—This has long been the leading variety shipped from Eastern North Carolina. It seems to be particularly suited to our conditions, but is not popular in the North. It is quite an early variety and a vigorous and healthy plant, and it holds its popularity with the growers better than almost any other sort.

Clyde.—This has been highly praised and is a productive variety of very moderate quality. It colors poorly, in our experience, and is not so early as the Lady Thompson. It is firm and ships well.

Brandywine.—A wonderfully vigorous grower and a fairly good bearer of large and fine quality berries of fine color and firm. It has perfect flowers and is a good pollenizer for the pistillate ones. It is a mid-season and late berry.

Hoffman.—One of the prettiest, firmest and best of the very early ones, which has been largely discarded for varieties of less value. We know of no very early berry yet brought out that is better than the Hoffman.

Excelsior.—This is a very early and prolific variety, but in our trials is always small, too small to make a profitable shipper. It may do better in the moist soils of the eastern part of the State, but here it is of little value.

Gandy.—This is the best very late berry—of good size and firmness and good quality, though rather rough in appearance.

Michel.—Another very early berry, which is good to illustrate how worthless a Strawberry can be. Earliness is the only good quality we ever observed in this variety, as it has been with us small and very unproductive.

Scaford.—A very large and productive mid-season berry. Its immense calyx makes it look rather rough in the boxes, but it is a fine berry and a good shipper.

Howell.—Very large and a good cropper. Colors well but is rather soft.

Nick Ohmer.—A strong plant and a fair producer of immense berries; rather late.

Sharpless.—An old rather early and mid-season variety that holds its own as well as any. It does not do well on our dry soil but is fine on low lands.

Barton.—A very handsome and productive berry. Colors beautifully, but seems too soft for shipment.

Parker Earle.—Of no value whatever here. It sets an immense crop of fruit, but brings little to perfection. We have discarded it as worthless.

Jessie.—The Jessie, as we had it ten years ago, was a very large light-colored berry of fine quality, round in shape and productive, but too soft for market. Jessie, as we have now gotten it, is a different berry and worthless for any purpose.

Pride of Carolina and *Patrick* go out along with Parker Earle as not worth the space they occupy.

McKinley.—One of the earliest berries and of fairly good quality and size at first, but soon runs down small. Very productive, and on more moist soil may be valuable.

Cumberland Triumph.—One of the oldest varieties, but yet hard to beat. A strong grower and very productive of berries of a large size and showy appearance.

Johnson's Early.—Did not prove early here, and was a very poor bearer of small fruits.

Mexican.—Of no value at all, so far as we can judge from two seasons' trial.

Ridgeway.—This is one of the very best mid-season berries—showy and very productive. We would plant this largely.

Sample.—A showy and high-colored berry, but like Barton, too soft to ship well.

The list might be extended further, but these include not only the best, but the most worthless. We have said just what we think about each from our own tests.

RASPBERRIES.

In the language of the nursery, there are but two classes of Raspberries—the Red Raspberry and the Black Cap. But the term Red Raspberry includes varieties belonging to different botanical species, possessing different characteristics as to hardiness and quality, as well as color, for there are some of this class of a yellow color, as there is also in the Black Cap class. There are also some varieties which, while not truly red, are reddish purple and are, therefore, by nurserymen classed as red. The main distinction between the two nursery classes is in the way they are propagated, for while almost any Raspberry may be grown from root cuttings with bottom heat under glass, the Black Cap class make few suckers from the roots and propagate slowly in this way, and are commonly grown by rooting the tips of the mature canes of the same season's growth. These are by far the best plants to be had of the Black Cap class. The Red Raspberries, whether belonging to the European or American, species are all easily increased by root cuttings planted in the open ground in the spring, or from suckers from the old stools. These last, however, should never be used if plants grown from root cuttings are to be had. The highest flavored of the Red Raspberry class are those derived from the European *Rubus Idæus*. But these are tender in the North in winter and easily injured by the sun in summer in the South. In fact, in all the warmer sections of this State the Red Raspberries are not so productive as they are in the Middle States, though they are still worth growing for the home use and the local markets. The Black Cap class are far more productive here. In our western mountain country all varieties of the Raspberry reach their highest perfection, and even where the fruit can not be marketed fresh they may be made profitable by evaporating. In fact, the modern fruit evaporators offer a great opportunity for profit to those in the western section remote from railroad facilities. The chief trouble in the warmer parts of the State with the Red Raspberries is their liability to have their canes killed in summer. Hence we should select for these the coolest soil at hand. Even in the shade of orchard trees they will bear well, and in the home garden the best place for the Raspberry bed is along the north side of a board fence where they will be sheltered from the heat of the sun. With the Black Caps we have found it an advantage to pinch the young canes during the summer to cause them to branch and take on a more bushy habit. The plants should be set in rows six feet apart and the plants three feet in the row. The best method we have tried for training is to set stout posts at intervals along the rows and stretch a single wire from post to post about four feet from the ground. The fruiting canes are then tied out fan shaped

to this wire. The cultivation should be of the cleanest, but shallow, so as to avoid the cutting of the roots and the increase of suckers as much as possible. For a fertilizer for the Raspberry there is nothing better than a compost of stable manure and woods earth piled up in the spring and turned frequently during the summer to be applied liberally during the following winter. When the land is kept fertile by this means a plantation of raspberries will last in productiveness for many years.

PROPAGATION.

For the increase of the Red Raspberry class take up some old stools and cut the long roots into pieces about three inches long. Do this in the fall after the leaves have fallen. Mix the cuttings with sand in a box and bury it in the earth for the winter. In early spring prepare a nursery bed thoroughly and mark out shallow furrows in which the cuttings are dropped closely and then covered. As they shoot above ground the cultivation must begin and be kept up clean during the summer. In the fall the plants will be ready to transplant to their permanent quarters. In the case of new and scarce varieties the propagation can be done more rapidly under glass in a heated green-house. Many years ago, when the Herstine Raspberry was first brought out, a friend bought two large plants for which he paid \$2.50 each. This was about the first of January. Seeing that the plants had an abundance of long roots I told him that if he would let me have them I would propagate them during the winter and give him one half in the spring. He agreed to this and gave me the plants. I cut the roots into one-inch pieces and placed them in the sand of the cutting bed in the green-house where they had a strong bottom heat. As fast as they showed any growth they were lifted from the sand and potted into three-inch pots and placed in a cool green-house. When the roots of the old plants were trimmed I potted the stumps and placed them, too, in the green-house. When my friend came in the spring I gave him 129 plants for his share, greatly to his surprise, and each one of the potted plants made as good a plant the following summer as either of the old plants would have made. At the same time I took him into the green-house and showed him the ripe fruit on the old canes. This rapid propagation pays well when the plants are selling at fancy prices, but will not pay when they have come down to the normal price of root cuttings. But it shows what can be done by skillful propagation. When the Philadelphia Raspberry was new and high priced a grower in New Jersey thought to get ahead of the market and built a long green-house for propagating them. He filled this house with cuttings of the ripe canes and failed to grow a plant. Had he known the nature of the plant he was working with and had

filled the house with root cuttings he would have had a great success instead of failure.

The propagation of the Black Cap varieties is done in a different manner. They are difficult to grow from root cuttings, and the common method is to layer the tips of the long canes in the soil along the rows about midsummer. Each tip is pegged fast and covered with soil and they root with great ease and make plants with a great mass of roots ready for the planting in fall or spring. The Dewberry can be increased in the same way. Some Raspberries have a habit of making fruit in the fall on the young growth of the same season. Most of these belong to the European strain, but some American varieties have the same habit. These fall-bearing Raspberries are seldom very productive in the ordinary season, and if a full crop is desired in the fall the canes should all be cut to the ground in the spring, and only the fall crop looked for. Where, for any reason, it is not desirable to train to horizontal wire a good plan for training the plants is to set a stake on each side of the hill and tie part of the canes to one stake and part to the other. Where the growth has been strong the canes should be slightly shortened back in tying them up in spring.

WINTER PROTECTION.

In the warmer part of the State east of the mountains all Raspberries are hardy in winter, but are all the better if laid flat on the ground during the cold weather. In the mountain country all the Red Raspberry class will be safer with an efficient winter protection. The best way to accomplish this is to gather the canes in a bunch, bend them to the ground as flat as possible and cover with earth. The native Black Caps will not be hurt by full exposure. In all parts of the State the Trailing Blackberry or Dewberry is safer lying flat on the ground in winter or covered where winters are very cold.

VARIETIES.

Cuthbert.—This is about the only Red Raspberry which we have tested that has been found to succeed well in our climate. It needs rich and moist soil of rather a heavier character than that for the Strawberry, and the canes should be kept pinched to induce a bushy growth and to enable the plant to resist the summer heat.

Gregg.—This is about the best of the Black Cap Raspberries that we have tried.

Shaffer.—This belongs to a different class from either of the above. It seems peculiarly suited to southern conditions, and while not remarkably prolific its fruit is of the largest size and a pleasant

acid flavor. If cut to the ground in the spring the young canes will make a fine crop in the fall. It is well worth growing in the home garden. In fact, except for a local market the Raspberry is hardly worth growing in the South, except for home use. This means for the warmer part of the State. In the mountain country west of the Blue Ridge any of the varieties of Raspberries grown in the North will do well.

BLACKBERRIES AND DEWBERRIES.

The Blackberry, both of the high bush sorts and the Trailing Blackberry, or Dewberry, as it is called, are becoming one of the most profitable small fruits for market in this State after the Strawberry. Following the Strawberry crop closely, the Dewberry and the earlier varieties of the Blackberry come in very well with the grower of small fruits to keep up the shipment later in the season.

PROPAGATION.

What has been said in regard to the propagation of the Raspberry is equally applicable to the Blackberry. The plants of the bush sorts grown from root cuttings are always more desirable than the suckers from the old stools, as they are far better supplied with roots. The sucker remaining attached to the old plant and supported largely by it, does not develop the mass of roots the plant grown from a separated roots cutting does, and the root cutting plant will always make a finer growth of canes the first season. The Dewberry, as we have intimated, can be propagated in the same way the Black Cap Raspberries are, by rooting the tips of the canes. Very few of the Blackberries in cultivation have resulted from nursery-grown seedlings, nearly all of them having come from chance plants found growing wild. There is great room for more intelligent culture and the growing of seedlings from selected varieties, as is done with other fruits.

Recently there has been sent out a plant under the name of Loganberry, which is claimed to have been the result of a cross between the Blackberry and the Raspberry. The fruit is reddish in color and the size of a large Blackberry. It has decidedly a Raspberry flavor, and it opens up a possibility in the crossing of these fruits that may lead to good results. The Loganberry, in my experience, has been very unproductive, though the fruit is good. It is very slow of increase, as it will not grow from root cuttings. The only way so far in which I have succeeded in propagating it is to pot some old plants in the fall and keep them in a cool house till mid-

winter and then bring them into a growing temperature and as the side shoots grow take them off when inch or two long and root them in the propagating bed with a strong bottom heat. This is too slow for commercial purposes, and the plant will be scarce for some time. But in its present shape it is not of any value for market purposes on account of its unproductiveness. It may become the parent of better kinds in the hands of diligent improvers.

PLANTING AND CULTURE.

The same directions given for the planting and training of the Raspberry will apply equally to the Blackberry, at least to the bush varieties. We plant them in rows six feet apart and three feet between the plants in the rows, and tie the canes to a wire in the same way as Raspberries. An exception to this should be made with the Dewberry. Some have practiced the training of the long canes to a wire stretched about two feet from the ground, and some have substituted a hoop pole for the wire, as the canes are apt to chafe in the wind against the wire and get injured. We prefer to tie the canes to tall stakes similar to the poles used for Lima beans in the garden. Trained in this way the plants can be set five feet apart each way. After the fruiting is over the young canes should be trained in along the rows to be out of the way in cultivation, but they should not be tied up to the stakes till the following spring, since they are safer during the winter on the ground, which is their natural place, and if tied up in the fall they may be seriously injured during the winter.

The long canes of the Dewberry should be shortened very little, but the weak surplus canes should be cut out entirely. The canes of the bush sorts in a fertile soil will need considerable cutting back in spring, and during the growing season all suckers that are not needed to reproduce the hill should be kept chopped out at the surface of the ground, as deep digging will only tend to multiply them.

VARIETIES OF BLACKBERRIES.

Lucretia.—This is about the only one of the Trailing Blackberries, known as Dewberries, which has been grown to any extent in the South, and so far it is about the only one worth growing. It is early, large and productive, though it seems to be more subject to the disease Anthracnose than most other Blackberries.

Wilson's Early.—This has been for many years the standard early Blackberry. It is claimed to be a cross between the Dewberry and the High Bush Blackberry, and its habit of growth would seem to confirm this. It is an early and very large berry, and always brings the top of the market. The chief difficulty with it is its ten-

dency to run into double flowers, thus making very pretty white roses but no berries. Owing to this habit it has become risky to plant.

Wilson Junior.—Is claimed to be a seedling of the above, and better. We never have found that it is in any way superior to the old Wilson.

Early Harvest.—A very early berry, coming right along after the Lucretia Dewberry. It is smaller in size than Wilson and generally sells for less per basket, but its immense productiveness more than atones for this, and its firmness for shipping is also in its favor. We regard it as about the most profitable Blackberry for the South.

Kittatiny.—This is, in our opinion, the finest Blackberry grown. The canes are stout and vigorous and the fruit very large and fine. It is not very early, however, and will be better here for the home garden than for market. Its main fault is its liability to the red rust fungus.

Iceberg.—This is the best White Blackberry yet introduced. It is valuable as a curiosity and for the home garden, but has no market value and is very late.

There are some newer varieties offered with great claims, and we hope to test some of them, but here give only such as we know from experience.

GOOSEBERRIES AND CURRANTS.

The Gooseberry is only adapted to culture in the cool valleys of the mountain country. There it may be useful for the home garden. In the warmer parts of the State it is uniformly a failure, and in no section is it of value as a market fruit. The fruit is usually sold green and the supply for the northern markets comes from nearby plantations, where the Gooseberry is seldom considered very profitable. Currants, too, are better adapted to the western and cooler parts of the State, though in cool, moist soils they will produce fair crops in other sections, but not to the extent to make them of value as a market fruit. The finer varieties of the Red Currant might be made profitable in the elevated western part of the State. Gooseberries and Currants are both almost unknown in the warmer parts of the State even in old gardens.

They are both easily propagated by cuttings of the one-year wood made about ten inches long and set in the open ground in the fall in nursery rows, and transplanted to their permanent location in the following fall. It is useless to attempt the cultivation of Gooseberries and Currants except in the more elevated and cooler sections of the State.

GOOSEBERRIES.

It is useless to plant Gooseberries anywhere in the State except in the elevated valleys of the western mountain country. In the warmer part of the State they are utterly worthless and will not make fruit.

Downing.—This is an American variety, and about as good as any, as none of the large English sorts are of value in this country.

CURRANTS.

While not so absolutely certain to fail as the Gooseberry in the warmer parts of the State, the Currant is, nevertheless, far less productive here than in the North. In the mountain country in moist bottom land they will do finely. Here they need a moist and fertile soil and a half shaded place.

Red Dutch.—This is the oldest variety and about the heaviest bearer. The White is similar, except in color.

Cherry.—This is a far larger currant than the Dutch, but less productive and smaller in cluster.

Fay.—This seems to combine the good qualities of the above. Larger in bunch than Cherry, as large in berry and as prolific as the Dutch. It is about the best red currant.